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Application No. 10/517,277
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Reply to Office Action of April-2-2009

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Amendments to the Claims:

1. and 2. (Cancelled)

3. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, wherein said steps (d) to (i) are effected in a semi-continuous mode of operation.

4. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,

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(d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,

(e) separating the aqueous protein solution from residual oil seed meal,

(f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,

(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, wherein said steps (d) to (i) are effected in a continuous mode of operation.

5. to 10.(Cancelled)

11. (Previously presented) The process of claim 4 wherein said extraction step is effected by:

(i) continuously mixing said desolventized oil seed meal with an aqueous salt solution having an ionic strength of at least 0.10 and a pH of about 5 to about 6.8 at a temperature of about 5° to about 65°C, and

(ii) continuously conveying said mixture through a pipe while extracting protein from the desolventized oil seed meal to form an aqueous protein solution having a protein content of about 5 to about 40 g/L for a period of time up to 10 minutes.

12. (Original) The process of claim 11 wherein said salt solution has an ionic strength of about 0.15 to about 0.8.

13. (Original) The process of claim 11 wherein the salt solution has a pH of about 5.3 to about 6.2.

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14. (Previously presented) The process of claim 11 wherein the concentration of oil said desolventized seed meal in said aqueous salt solution in said mixing step is about 5 to about 15% w/v.

15. (Previously presented) The process of claim 11 wherein said temperature is at least 35°C.

16. (Original) The process of claim 11 wherein said aqueous protein solution has a protein content of about 10 to about 30 g/L.

17. to 19. (Cancelled)

20. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, wherein said desolventized oil seed meal is desolventized canola oil seed

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meal and, following said separating of the aqueous protein solution from the residual canola seed meal, the aqueous protein solution is subjected to a pigment removal step.

21. (Original) The process of claim 20 wherein said pigment removal step is effected by diafiltration of the aqueous protein solution.

22. (Original) The process of claim 20 wherein said pigment removal step is effected by mixing a pigment adsorbing agent with the aqueous protein solution and subsequently removing the pigment adsorbing agent from the aqueous protein solution.

23. (Original) The process of claim 22 wherein the pigment adsorbing agent is powdered activated carbon.

24. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

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(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, said desolventized oil seed meal is extracted with water and subsequent thereto salt is added to the resulting aqueous protein solution to provide an aqueous protein solution having an ionic strength of at least 0.10.

25. (Cancelled)

26. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 25 wherein said concentration step is effected by ultrafiltration to produce a concentrated protein solution having a protein content of at least 250 g/L.

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27. (Currently amended) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom.
- (b) solvent extracting the oil seed meal to recover residual oil therefrom.
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal.
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8.
- (e) separating the aqueous protein solution from residual oil seed meal.
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution.
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles.
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, wherein said concentration step is effected by ultrafiltration to produce a concentrated protein solution having a protein content of at least 200 g/L and The process of claim 25 wherein said concentrated protein solution is warmed to a temperature of at least 20°C to decrease the viscosity of the concentrated protein solution but not beyond a temperature above which the temperature of the concentrated protein solution does not permit micelle formation.

28. (Original) The process of claim 27 wherein said concentrated protein solution is warmed to a temperature of about 25°C to about 40°C.

29. to 31. (Cancelled)

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32. (Currently amended) The process of ~~claim 3~~ claim 4 wherein said concentrated protein solution is continuously mixed with said chilled water to provide a dilution of the concentrated protein solution by about 15 fold or less.

33. (Previously presented) The process of claim 32 wherein said chilled water has a temperature of less than 10°C.

34. (Original) The process of claim 33 wherein said dilution is by about 10 fold or less.

35. (Cancelled)

36. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight

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basis, wherein said recovered protein micellar mass has a protein content of at least 100 wt% ($N \times 6.25$).

37. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% ($N \times 6.25$) on a dry weight basis, wherein said oil seed meal is canola seed meal and, following recovering of the protein micellar mass therefrom, the supernatant is processed, on a batch, semi-continuous or continuous basis, to recover additional quantities of protein isolate therefrom.

38. (Previously presented) The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, and drying the concentrated supernatant.

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39. (Previously presented) The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, mixing the concentrated supernatant with the recovered protein micellar mass, and drying the mixture.

40. (Previously presented) The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, mixing a portion of said concentrated supernatant with at least a portion of the recovered protein micellar mass, and drying the resulting mixture.

41. (Original) The process of claim 40 wherein the remainder of the concentrated supernatant is dried and any remainder of the recovered protein micellar mass is dried.

42. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

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(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, wherein, as an alternative to said diluting, settling and recovering steps, the concentrated protein solution is dialyzed to reduce the salt content thereof and to cause the formation of protein micelles, and recovering a protein isolate from the dialyzed concentrated protein solution having a protein content of at least 100 wt% (N x 6.25) on a dry weight basis.

43. (Original) The process of claim 42 wherein said protein isolate recovery is effected by drying the dialyzed concentrated protein solution.

44. to 48. (Cancelled)

49. (Currently amended) A process of preparing a protein isolate, which comprises:

(a) crushing oil seeds to form oil and oil seed meal therefrom,
(b) solvent extracting the oil seed meal to recover residual oil therefrom,
(c) removing solvent from the extracted oil seed meal ~~The process of claim 25 wherein said solvent removal step is effected at a temperature of about 15° to about 25°C~~ under vacuum to provide a desolventized oil seed meal.

(d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8.

(e) separating the aqueous protein solution from residual oil seed meal.

(f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution.

(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles.

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(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, wherein said concentration step is effected by ultrafiltration to produce a concentrated protein solution having a protein content of at least 200 g/L.

50. (Cancelled)

51. (Previously presented) The process of claim 38 wherein the supernatant is concentrated to a concentration of about 200 to about 300 g/L.

52. (Previously presented) The process of claim 39 wherein the supernatant is concentrated to a concentration of about 200 to about 300 g/L.

53. (Previously presented) The process of claim 40 wherein the supernatant is concentrated to a concentration of about 200 to about 300 g/L.